SCIENCE

FRIDAY, SEPTEMBER 16, 1887.

THE LATEST NEWS from Stanley is dated Yambuya Rapids on the Aruvimi River. This is the most eastern point that could be reached by steamers, and here the overland journey to the Mvutan Nsige was to begin. The expedition, which consisted of 612 men, left Stanley Pool on May 1, on the 'Henry Reed,' of the American Baptist Mission, with 131 men on board; the 'Stanley,' of the Kongo Free State, carrying 364 men, 500 loads of baggage and goods, nine riding asses and a herd of goats, and the 'Peace,' of the English Baptist Mission, with 117 men on board, and towing two boats. The 'Stanley' towed the hull of the steel steamer 'Florida,' which had been launched the day before. Two miles above Kinshassa the 'Peace' met with an accident, her rudder being broken, and she had to return to Leopoldville for repairs. After this accident the expedition travelled steadily on; but the 'Peace' proved to be very slow, and was unable to keep up with the other steamers. A short distance below Bolobo another accident befell the expedition. The 'Stanley' struck a reef, and one of her sections was completely wrecked. Fortunately she could be restored to use by patching plates underneath. In order to make up for the time lost, Major Barttelot marched overland from Wamboko River to Kwamouth, and his party was afterward brought up to Bolobo by the 'Stanley.' Meanwhile the engineer of the 'Peace' had resolved to screw down the upper safety-valve, and by this expedient enabled the 'Peace' to proceed at the same rate as the other steamers. The journey from Bolobo to the rapids of the Aruvimi was effected without any further delays or incidents. On June 18 this place was reached, and Stanley proceeded at once to build an intrenched camp, in which Major Barttelot is to remain. While Stanley's steamers ascended the Aruvimi, Tippo-Tip was conveyed on the 'Henry Reed' to Stanley Falls station, of which he is the chief. He was accompanied by 96 Zanzibari, and Major Barttelot, who had 40 Sudanese soldiers with him, commanded the steamer. It seems that Stanley was going to leave the Arabian trader at Stanley Falls, and proceed to the Mvutan Nsige alone. Barttelot was to return the day after his arrival at Stanley Falls, and to rejoin Stanley at Aruvimi Falls. The natives of Yambuya would not allow the expedition to land, but, on hearing the steam-whistles, fled into the woods. The next day a few returned, and were sent off with presents. Stanley hoped to gain their confidence within a short time. On June 20 the 'Stanley' left the Yambuya Falls, and arrived at Leopoldville on July 2. These are the latest letters from Stanley so far; but the cable informs us that he found the river navigable above the Yambuya Falls, and that he was able to proceed in boats. Probably the 'Henry Reed' brought this news to Leopoldville. It may be that the river proves to be navigable for a long distance, and in this case Stanley's march to the Mvutan Nsige will be greatly facilitated.

THE TRANSCONTINENTAL RAILROADS.[1]

THE transcontinental railroads cross great plains, high mountains, lofty plateaus, and broad basins, and follow the courses of long rivers. Nowhere do we find objects of greater interest to the traveller, geographer, geologist, or the student of natural history, than along these lines of travel. The rivers that rise on the eastern slope of the Rocky Mountains pursue an uninterrupted and peaceful course from the foot-hills, across the great plains, to the valley of the Mississippi. The rivers that rise on the western slope encounter range after range of mountains, some higher than the Rockies, and find their way to the ocean over high falls, through deep cañons, or by forcing a way through mountain ranges. Here is the longest persistent range of mountains in the world, — broad plateaus elevated from 8,000 to 10,000 feet above the level of the sea. Here are deep basins, with mountains so closely surrounding them that the streams, unable to find a way to the ocean, sink into the desert. Here is the valley of the Colorado, running through cañons 3,000 to 4,000 feet high, over 200 miles long, and so deep that in some places the sunlight never reaches the bottom. The rain, instead of fertilizing the ground, washes from the rocks every particle of soil, and leaves the country a desolate wilderness, devoid of vegetable or animal life. Here are high snow-mountains, and at their base deep valleys, sunk below the level of the ocean. There are mountains, more beautiful than Mont Blanc or the Matterhorn, rising directly from base to summit, 14,000 feet in height, with glaciers exceeding in extent and beauty any in Europe. From the far north to the extreme south are mines of gold, silver, and copper, and vast deposits of coal, lead, and iron-ore. Here the student of natural history finds fossils in endless variety and number, from the toothed bird to the miniature horse. As a compensation for the want of trees on the mountains, the largest and finest forest-trees in the world are found at their base, on the Pacific coast. The millions of buffaloes which formerly roamed over the plains are all gone, but their places are supplied by countless herds of cattle and flocks of sheep. Such a land is worth visiting; and the description of the country through which the railroads run, and of the roads themselves, must be of interest.

The traveller from the Atlantic to the Pacific by either of the transcontinental railroads enters the great plains, soon after crossing the 95th degree of longitude, near Winnipeg on the north, Omaha and Kansas City in the middle latitudes, or San Antonio at the south. Then commences the ascent, steadily continued until the top of the Rocky Mountains is reached. The land rises, at first slowly, then on steeper grades, and yet so gradually that the passenger on the Union Pacific reaches an elevation of one mile before he has seen the mountains or realizes that he has attained any considerable elevation. From the foot-hills, over the mountains to the Pacific Ocean, each road follows a route having its own features, so striking and distinct that no general description is of any value. The chief objects of interest are the great plains, the rocky mountains, the deep basins, the ranges of mountains west of the Rockies, and the plateau of the Colorado River; while the railroads — the work of man — vie in interest with the natural wonders.

The Great Plains.

Looking from Denver towards the west, or, better yet, from almost any part of the great plains in Colorado within 50 miles of the Rocky Mountains, are seen the foot-hills, then the mountains, rising higher and higher until lost in the distant snow-caps. Looking towards the east are the green and grassy plains falling in gentle undulations, north, south, and east, as far as the eye can reach, and for hundreds of miles beyond. These are the great plains of America, bounded by the Rocky Mountains on the west, the Arctic Ocean on the north, the Gulf of Mexico on the south, the Missouri and Mississippi rivers on the east. The great plains reach their culminating point between Denver and Colorado Springs, — at the divide between the waters of the North Platte and Arkansas rivers. From this elevation of 7,000 feet they slope northeasterly into Wyoming and Canada, towards the Arctic Ocean, easterly to the Missouri River, and southerly into New Mexico. The land, only fairly watered on the east, becomes arid towards the foot-hills of the Rockies, and, though rich and fertile, cannot be cultivated without irrigation. The rivers grow larger towards their sources, as the rainfall on the plains is insufficient to supply the

[1] The unfinished portions of the roads are included in the accompanying map.

loss by evaporation and irrigation; but there is no portion of these plains that deserves the name of desert, or that is comparable in degree of sterility with the cañoned country west of the mountains. It is only a few years since it was called the 'Desert of America,' and it was then believed that the great plains were unfit for cultivation or habitation. Then they began to be used for pasturage of cattle. Now, by a judicious system of irrigation, larger crops of wheat and grain are grown than in the great prairie States, while the detritus from the irrigating water more than compensates for the exhaustion of the soil by the crops.

The Rocky Mountains.

These mountains rise in Alaska, on the Arctic Ocean, far to the north of Sitka, and attain their highest elevation — 20,000 feet — in Mount St. Elias. They run through British Columbia, Idaho, Montana, Wyoming, and Colorado. They appear as high, level plateaus and spurs in New Mexico and Arizona, joining the Coast Range, to appear again as the Rocky Mountains or Cordilleras in Mexico, where they attain the height of 19,000 feet in Popocatapetl, passing thence through the isthmus of Central America into South America, where they form the back-bone of that continent, terminating near the Antarctic Ocean at Cape Horn. Mount Brown and Mount Hooker, in British Columbia, rival Monte Rosa in height. The highest mass of these mountains is in Colorado, where there are nearly one hundred peaks 14,000 feet in height, none of which are 500 feet above or below that height. It is impossible to give definite boundaries to the Rocky Mountains, as they enclose many ranges and systems. Major Powell of the Geological Survey classes the Rocky Mountains into the Park, the Geyser, and the Basin systems. In the mountains and plateaus of these systems bare rocks are seen to an extent rarely found on the globe, and the region is largely destitute of soil and timber. In striking contrast to this destitution are the parks in Wyoming, Colorado, and New Mexico. The largest of these are the North, Middle, and South parks of Colorado, — elevated plains containing from 800 to 1,000 square miles, 9,000 to 10,000 feet above the sea-level, surrounded by high mountains, with a fertile soil, furnishing fine pastures for cattle in summer, but with the warm season so short that wheat and grain do not ripen. In these mountains rise the great rivers of the world, — the Missouri, Mississippi, the Columbia, and Colorado, in North America; and the Amazon and La Plata in South America.

The Geyser system is in Wyoming. The mountains are not so high as in the other systems, but in their recesses lies the Yellowstone Park. Before the geysers of this park "all others in the world, even the celebrated ones of Iceland, sink into insignificance. This park seems to have been set aside by the Great Maker for the exhibition of the action of volcanic forces."

The Great Basin.

The Great Basin, so called because it has no drainage into the ocean, extends from the summit of the Rocky Mountains and the plains of the Colorado River west over one thousand miles, far into California, and from Oregon in the north over fifteen hundred miles south into Lower California, south of Los Angeles and San Diego. It includes the middle and western parts of Colorado, the whole of Utah and Nevada, and parts of Oregon and California. Numerous short ranges run invariably north and south, with deep valleys between them. The greatest of the basins is that of Salt Lake, five hundred miles long and six hundred miles wide, between the Rocky and Sierra Nevada mountains. Here rain rarely falls, and the rivers which rise in the mountains surrounding it on every side are soon dried up, or, like the Carson and Humboldt, after running from 100 to 300 miles, sink into the desert and disappear. Large lakes are formed in the deeper valleys, but the water in them is salt. For hundreds of miles the traveller sees only alkali plains, breathes alkali dust, and drinks alkali water. Far to the south-west is Death Valley, over 150 feet below the level of the ocean, so called from the number of emigrants who lost their lives from hunger and thirst in sight of the snow mountains and close to the promised land. But, as if to compensate for the desert of death, on the opposite side of the Sierras are the Yosemite and the big trees of Calaveras. The mountain ranges west of the Rocky Mountains are popularly called the Cascade, Sierras, and Coast Range.

The Cascade Mountains.

The Cascade Mountains rise in the upper part of British Columbia, follow the coast-line through British Columbia and Washington Territory, passing thence through Oregon, and die out in northern California, to be succeeded by the Coast Range. The snow-line is reached at a lower elevation than in Switzerland, and, unlike the Alps, the great mountains rise directly from the sea 14,000, 15,000, and even 20,000 feet in height. From the sides of Mount St. Elias in Alaska — the highest mountain in America — vast glaciers run into the ocean, exceeding in grandeur and extent any found in Switzerland. Mount Baker and Mount Tacoma in Washington Territory, and Mount Hood in Oregon, radiant with eternal snow, are more beautiful than Mont Blanc or the Matterhorn; the glaciers on Mount Tacoma equal those of these mountains, while, to add to the sublimity of the scene, smoke is frequently seen rising from the craters of Mount St. Elias and Mount Adams. There is probably no other country where, on the same parallel of latitude, and at the same elevation, there are such great differences in climate, soil, and vegetation as on the east and west sides of the Cascade Mountains. On the east are barren hills and plains, devoid of all vegetation save the sage-brush and bunch-grass; the climate is hot in summer, cold in winter, and dry as that of the Desert of Sahara. On the west side of the range, and not fifty miles away, the country is thickly studded with the finest of forest-trees, abounding in vegetable life, with a continuous rainfall, the climate mild in winter and temperate in summer. On the foot-hills and in the western valleys the deep green of the Douglas fir, extending for hundreds of miles, contrasts with the pure white of the snow. The only drawback is the thick clouds of smoke from burning forests, which usually darken the sun and hide the mountains from view for two or three months in the summer.

Sierra Nevada.

The Sierra Nevada Range might be called a continuation of the Cascade Mountains; but those are of volcanic origin, and the Sierra Nevadas are granite, though traces of volcanic action are often found on the flanks and base. It commences at Mount Shasta, 14,400 feet high, and runs in a southerly direction to Tejon Pass, where it joins the Coast Range not far from Mount Whitney, the highest mountain in the United States south of Alaska. There are but few passes over these mountains, and the Pacific slope is very steep, the Central Pacific road descending 6,300 feet in 80 miles.

Coast Range.

This is a long range of sand-stone mountains. Rising in Oregon, south of the Columbia River, it follows the coast through Oregon and California into Mexico, where it unites with the Rocky Mountain Range proper. It is lower than the other ranges, attaining an elevation of 3,000 to 5,000 feet. At the foot of this range, far to the east, is the Willamette River in Oregon, the Sacramento and San Joaquin rivers in California, with long narrow valleys unsurpassed in richness. On the western slope the rainfall is abundant, and the valley and foot-hills are covered with a luxuriant growth of vegetation, — the redwood, Douglas fir, and other members of the *Sequoia* family, more useful than the big trees, and in large groups scarcely less imposing.

The Coast and Cascade ranges run parallel with the coast; and the Fraser, Columbia, and other large rivers, which rise in the Rocky Mountains, find a way through these ranges to the Pacific Ocean. The Fraser River forces its way through a deep cañon, 200 miles long, and makes a route for the Canadian Pacific; the Columbia River breaks through the Cascade Mountains at the Dalles, about three hundred miles south of the Fraser, and makes a way for the Northern Pacific and Oregon Short Line.

Canadian Pacific Railroad.

From Montreal this road follows the rich and fertile valley of the Ottawa 350 miles, then through a wilderness of lakes, rocks, and streams to Lake Superior, around its northern shore, past lakes and woods and over marshes, to the 94th degree of longitude, about 100 miles east of Winnipeg. A more God-forsaken country I have rarely seen, — the land too rocky, thickly wooded, and wet for cultivation, the trees too low and stunted for timber. Mines are supposed

to exist, but are not yet worked to any considerable extent. This was the most expensive section of the road, the outlay being some $12,000,000 for 200 miles, and a single mile of the heavy cuttings and tunnels cost as much as $750,000. The company expended $2,100,000 for explosives, most of which were used on this section. From the 95th degree of longitude, through Winnipeg to Calgary at the foot of the Rockies, it runs across the great plains nearly one thousand miles. The plains are generally rich, and, when irrigated, yield good crops; the rainfall, light at Winnipeg, decreases towards the mountains. The country north of the railroad, on the north branch of the Saskatchewan, is richer, has a greater rainfall, and bears heavier crops. It was on the line of this branch that the first surveys were made, and, under Mount Hooker, the highest of the Rocky Mountains, a pass was found only 3,760 feet high, and a route little longer than the one finally adopted; but beyond this pass the country was so rough and the mountain ridges so numerous that another route was found after the expenditure of over $3,000,000 in the survey of twelve thousand miles of different routes. The ascent from Winnipeg, 700 feet high, is gradual to Calgary, 2,900 feet above the sea-level, thence to the summit at Stephen, 5,296 feet, 150 miles from Calgary. Thence the route descends to the crossing of the Columbia River, where, instead of following the great bend, some 200 or 300 miles, it climbs the Selkirk Mountains to the Glacier Hotel, 4,300 feet high. The glaciers come down the mountains close to the hotel, and are easily reached by a short walk. Here are most beautiful views of glaciers, woods, and mountain peaks, affording varied and delightful excursions to the tourist. Between the first and second crossing of the Columbia River, 80 miles, the road ascends 1,788 feet, and descends 2,761 feet. The Gold Range is then crossed at a low grade, when the road strikes the Fraser River, about 100 miles west of the Columbia, and follows its course through the Cascade Mountains, in deep cañons for a long time considered impassable. After leaving the river, the road runs across the low lands to Vancouver on the sound. This is the shortest line from the 95th degree of longitude to the Pacific Ocean, with the lowest grade and the greatest length on the plains. It is claimed to be the only line that runs from ocean to ocean, and is connected with Japan and China by its line of steamers. The Canadian Pacific Railroad Company received from the Dominion Government grants of money and land far exceeding those paid to any of our railroads, and has recently obtained a subsidy for carrying the mails across the continent.

The Northern Pacific Railroad.

The Northern Pacific Railroad starts from St. Paul on the Mississippi and from Duluth on Lake Superior, 600 feet above tide-water. It runs nearly due west from Duluth, 1,000 miles to Livingstone at the foot of the Rocky Mountains. The country, after leaving Lake Superior, is rough, rocky, and is of little value except for timber, for 150 miles. There the great plains begin, and the land is fertile, producing abundant crops if well watered, for about 600 miles, when the Bad Lands are reached, about 200 miles west of the Missouri River.

The other transcontinental railroads, in crossing the plains, have a regular ascent, following the valleys of rivers, but the Northern Pacific crosses the Mississippi, Red, James, Missouri, and Little Missouri rivers, and the divides between these rivers, at right angles. While there is a general up-grade, the ascent is not as regular as on the other lines. West of the Little Missouri the up-grade continues over the Bad Lands to the valley of the Yellowstone; the road follows that valley for 330 miles, to Livingstone at the foot of the Rockies. The line passes within a few miles of the Big Horn, and there, where eleven years ago General Custer with his entire command was massacred by the Indians, now the peaceful settlers herd their cattle, and cultivate the fields of wheat and grain. At Livingstone the Yellowstone turns south, opening a way into the mountains. A branch of the road runs to the Yellowstone Park, about 50 miles distant, and the traveller is well repaid for the whole journey if he can spend a week in the park. The main line, on leaving Livingstone, crosses the first range of the Rocky Mountains at Bozeman summit, 5,570 feet in height. The road then descends to the valley of the Missouri, and follows down the river, 50 miles, towards Helena, and passes through that mining centre, brilliantly lighted with electric lights, to Mullen Pass, where it crosses the great divide at a height of 5,547 feet, 1,200 miles west of St. Paul, thence, with a general descent, following the waters of Clarke's Forks through Montana and Idaho. Montana, the watershed between the two oceans, has an elevation of about 4,000 feet above the sea-level. The winters are very cold, the summers hot and dry; only scanty crops can be raised, for there is little rain and few irrigating streams. The cattle range over the plains and mountains in summer, and, if properly fed and protected for two or three months, will stand the long cold winters. When storms come, the cattle, unless protected, drift before the wind for many miles until they find shelter, and when the storm abates slowly return to their grazing grounds. The general elevation of Idaho is lower than that of Montana, and its great lakes soften the temperature, while the warm winds from the Pacific Ocean temper the winter climate. There is more rainfall and better soil; wheat and grain grow in greater abundance. In both of these territories there are great stores of precious metals, the yearly product of Montana being about $25,000,000. The road runs around the beautiful Lake Cœur d'Alene, then for many miles down the Spokane River, with its beautiful falls, to Pasco on the Columbia River. Here the road branches, one line following the Yakima River, crossing the Cascade Mountains at a height of about 4,000 feet, thence to Seattle and Tacoma on Puget Sound. The other branch follows the Columbia River, which forces its way through the Cascade Mountains, at the Dalles and Cascades, to tide-water at Portland, about 100 miles from Astoria at the mouth of the river. The route over the Cascade Mountains, reaching the fine harbors of the sound, will eventually be the main route. The Northern Pacific is comparatively free from the great alkali deserts found on the more southerly roads, and is therefore more comfortable for the traveller. Few more beautiful trips can be found than over this road by the Yellowstone Park to Tacoma, and thence by the Oregon and California road to San Francisco, and home by the Yosemite and the Atchison, Topeka & Santa Fé Railroad.

Union and Central Pacific Railroads.

The Union Pacific Railroad, with its Kansas branches, the Chicago, Burlington & Quincy, and the Atchison, Topeka & Santa Fé, cross the great plains from the Missouri River to the foot-hills of the Rocky Mountains, over a country very similar to that crossed by the Canadian Pacific, but with steeper grades. The Union Pacific begins at Omaha, runs thence 500 miles to Cheyenne on an up-grade averaging ten feet to the mile, increasing in steepness as it approaches the foot-hills; then it rises more rapidly, reaching the summit at Sherman, 8,240 feet above the sea-level, 550 miles from Omaha. From thence to the top of the Wasatch Range it runs on an elevated plateau, nowhere less than one mile and a quarter above the sea-level; it then descends rapidly 3,800 feet to Salt Lake, follows the Humboldt Mountain, and crosses the Humboldt Valley, over 300 miles, until the river sinks into the desert, then rising rapidly to the summit of the Sierra Nevadas, 7,000 feet, passing by Tahoe, the most beautiful of lakes, then down a grade, which when it was built was the longest and most rapid descent in the world, to tide-water near Sacramento. On turning round a promontory called Cape Horn, near the top of the Sierras, the traveller looks down a perpendicular descent of 2,000 feet into the valley of the American River, — one of the most beautiful views in the mountains.

The Union and Central roads were the first transcontinental railroads built. The construction was carried on during the civil war, and was finished only four years after its close. The grades are much heavier than those of either of the other roads, and it runs for a longer distance through the mountains. The grades are so unfavorable, compared with other lines, that the Union Pacific has sought another outlet by the way of the Oregon Short Line to the Pacific, and the Central Pacific has found an easier route to the Atlantic by its Southern Pacific Railroad. The Oregon Short Line, a road built and leased by the Union Pacific, leaves the main road at Granger, 875 miles from Ogden, crosses the Rocky Mountains at an elevation of 6,279 feet, to the Snake River at American Falls, 1,100 miles from Ogden, and follows the valley of this river to the Columbia, at Walla Walla junction. The valley of the Snake River

is fertile. It produces fine crops with little, and in many places without any, irrigation, not on account of a greater rainfall, but from the different character of the soil. The grandest scenery in the mountains is found on the Denver & Rio Grande Western Railroad. This road starts from Ogden, the junction of the Union Central Pacific Railroad, traversing the valley of Salt Lake and its River Jordan, crossing the many ranges of the Rockies by passes over two miles above the sea-level, through deep cañons so steep and narrow that in the Royal George Cañon the road is carried along the river on a bridge, no way being found for the road on the mountain side. At the eastern terminus the Denver and Rio Grande road connects with the Atchison and Topeka at Pueblo, and with the Union Pacific at Denver.

Atchison, Topeka & Santa Fe.

Kansas City has heretofore been the starting-point of this line, but it is now being rapidly extended east to Chicago, and will soon run a through train from Chicago to the Pacific Ocean. From the eastern boundary of Kansas it follows the line of the Arkansas River 600 miles west to La Junta, 4,000 feet above the level of the sea. Here it turns and runs to the south-west, 330 miles, to Albuquerque, thence turns and runs due west to the Pacific Ocean. It crosses two ranges of the Rocky Mountains, the first at Rincon, on the boundary line between Colorado and New Mexico, the highest pass on the road, 7,600 feet; the second at the continental divide, 1,000 miles from Kansas City, 7,200 feet high; thence along a high plateau nowhere less than one mile in elevation, 700 miles, following the Little Colorado River; thence it descends rapidly 125 miles, to the Needles, where it crosses the Colorado River at the boundary line between Arizona and southern California, 477 feet above tide-water. Then the Sierra and Coast ranges are crossed, at a height of about 3,000 feet, and tide-water is reached at Los Angeles, San Diego, and San Francisco. Near Albuquerque, 900 miles west of Kansas City, is a branch of the road to Santa Fé, the old city of the plains, famous for its Mexican remains. Here, too, are the hot springs of Los Vegas, having a winter climate unequalled for health. The air is dry and bracing, and more temperate than that of the far-famed Colorado Springs. Holbrook, 1,100 miles from Kansas City, is sixty miles from the renowned Pueblos of the Moquis tribe of Indians.

The Plateau Country, so called, through which the Colorado River and its branches run, is reached either from Peach Springs, 1,400 miles from Kansas City, by a stage-road, only 16 miles, to the Grand Cañon, or from Flagg Staff, 60 miles from Point Sublime. Here is the sublimest scenery on the continent, as yet but little visited for want of easy means of access. The more it is known, the greater will be the number of visitors. The Plateau Country is the land of cañons, all of which lead down to one great trunk-channel cleft through the heart of the Plateau Country, 800 miles long, and with a depth of from 2,000 to 6,000 feet. Of the many cañons in the plateau, the Grand Cañon is the "most magnificent as well as the grandest geological section of which we have any knowledge." It is 218 miles long, from 4,500 to 6,000 feet deep, averaging 5,000 feet. Its width from crest-line to crest-line is from 4½ to 12½ miles, the widest portion being always the grandest. Not far from the Grand Cañon, near Peach Springs, is Little Zion Valley, a cañon running into the Grand Cañon. "In its proportions it is almost equal to the Yosemite, but in its nobility and variety of the sculptured scenery and wonderful variety of colors, there is no comparison.

Southern Pacific Railroad.

It is hardly possible to realize how recently the territory through which this road runs came into our possession. California in 1846 was an "outlying and neglected Mexican province." New Mexico, Arizona, and southern Colorado were purchased of Mexico in 1853, under the Gadsden treaty, for $10,000,000, "because the low level of the mountains below the Gila was the natural route for a southern transcontinental railway." Soon after the purchase, schemes were formed in the East for constructing a Southern Pacific road. Fifteen years ago a few hundred miles of road were built in Texas, and the promoters applied to Congress for a subsidy. Then the managers of the Central Pacific, who controlled all the business of the Pacific slope, determined to construct the Southern Pacific without a subsidy, and thereby retain their monopoly. The road was commenced in the year 1875, and was completed in 1881. The eastern termini of this road are at New Orleans and Galveston. Like the Canadian Pacific, it crosses the continent from ocean to ocean. It passes through the rich lowlands of Louisiana and Texas, reaching the great plains a little west of San Antonio. Near this city it meets the Rio Grande River, follows its valley, ascending by a steady grade to El Paso, 1,200 miles from New Orleans; thence through New Mexico and Arizona on an elevated plateau about 4,000 feet high for 200 miles, by the foot-hills and over the spurs of the Rocky Mountains, to the continental divide at Dragoon Summit, 4,614 feet above tide-water; thence over the valley of the Gila and its branches to the Colorado River, which it crosses at Yuma near the mouth of the Gila, through a dry and arid desert rich in mines of silver, copper, and lead, — a country long desolated by the Arapahoes; thence down into the great desert of California, 260 feet below the level of the sea, and over a low range or spur of the Sierras to tide-water at Los Angeles and San Diego (the country near Los Angeles is the garden of California, where the orange-tree buds, blossoms, and ripens its fruit all the year round); then over the main range of the Sierras at Tehachapi, 4,026 feet high, and down into the valley of the San Joaquin and Sacramento rivers to San Francisco. The grade of the road is lower and more favorable than that of either of the other transcontinental roads. It is a favorite route for passenger travel in the winter and spring. In the summer the heat is so intense and the dust so thick as to render it uncomfortable.

The great plains begin at San Antonio, and run about 700 miles to the foot of the mountains near El Paso. They are much lower than in Colorado, Utah, and Wyoming, but are more arid. Occasionally on the plains west of San Antonio there has been no rainfall for one and even two years. These plains would make the finest pastures for cattle when there is sufficient rain, as the snows are light, the winters warm, and the pastures good the year through. This road and the Atchison, Topeka & Santa Fé are the only roads without snow-sheds.

The Union and Central roads, when built, relied almost entirely upon the through business, now mainly upon local business, as the through business has become of comparatively little importance because it is divided among five lines. The increase in the number of roads and the large reduction of rates have stimulated emigration, and thus the business, both through and local, is steadily and rapidly increasing. Each road now does as much business as the Union and Central when they monopolized the whole. The construction of competing roads has resulted in great benefit to the public, and, when the local business is built up, the revenues and profits of the several roads must be very large.

Other roads are also seeking new routes across the mountains. The St. Paul, Minneapolis & Manitoba has constructed several hundred miles in Dakota, and is constructing its road at the rate of five miles a day, through Manitoba and up the Missouri River to Fort Benton. It is also reported that parties in the interest of this line have commenced the construction of a line from Seattle, across the Cascade Mountains, down the Yakima River, to the Moxee Valley, and thence across to the great bend of the Columbia. The Chicago and Northwestern has already crossed the great plains in Nebraska and Wyoming, to the foot-hills of the Rocky Mountains, 1,000 miles west of Chicago, and will ultimately be forced to seek a route over the Rocky Mountains, along the northern fork of the Platte River.

Comparative Statement.

It will be interesting to compare the elevation and length of the different transcontinental railroads. The greatest average elevation of the mountain system of North America is in southern Wyoming and the western part of Colorado. It therefore follows that the passes over the mountains should be the highest in this section.

The highest railroad passes are: —

Kicking Horse Pass, on Canadian Pacific	5,596 feet.
Bozeman Pass, Montana, on Northern Pacific	5,570 "
Sherman Pass, Wyoming, on Union Pacific	8,235 "
Pass on Denver & South Park Railroad, Union Pacific	11,250 "
Marshall Pass, Colorado, on Denver and Rio Grande, about	12,000 "
State Line, Colorado, on Atchison, Topeka & Santa Fé	7,622 "
Dragoon Summits, on Southern Pacific	4,614 "

The length of the several roads, the width of the great plains and mountains, are controlled by the configuration of the continent. The Rocky Mountains run in a south-easterly direction, while the trend of the coast is southerly, even a little south-westerly, to San Francisco, and then south-easterly to the Isthmus of Panama. This causes a diminution in the width of the great plains on the line of the Union and Central Pacific roads, and a corresponding increase in the width of the mountain systems and in the length of the road. On the Canadian Pacific the great plains are 1,000 miles wide, and the mountains about 500 miles wide. On the Union Pacific the plains are 500 miles in width, the mountains 1,300 miles.

The distances on the several roads from a common degree of longitude, say the 97th, to the Pacific Ocean, is shown in the following table: —

Canadian Pacific to Vancouver	1,480 miles.
Northern Pacific to Portland	1,620 "
Union Pacific and Oregon Short Line to Portland	1,724 "
Union and Central Pacific to San Francisco	1,885 "
Atchison, Topeka & Santa Fé to San Diego	1,694 "
Southern Pacific to San Francisco	2,024 "
Southern Pacific to San Diego	1,610 "

All these roads require a harbor at the terminus on the Pacific coast. North of the lower end of Puget Sound the coast is studded with islands and excellent harbors. From Puget Sound south the mountains rise almost directly from the ocean, there are few islands, and the only harbors are at the mouths of the rivers, and these are generally barred.

The Canadian Pacific finds a harbor at Vancouver on Puget Sound; the Northern Pacific was forced to cross the Cascade Mountains to reach a good harbor at Seattle and Tacoma on the sound; the Oregon Short Line has its terminus at Portland, 100 miles from the mouth of the Columbia River, where there is a bar which cannot be crossed in stormy weather; the Central and Southern Pacific have good harbors at San Francisco and San Diego; the Atchison, Topeka & Santa Fé at San Diego.

GARDINER G. HUBBARD.

PSYCHOLOGICAL MEDICINE AT THE INTERNATIONAL MEDICAL CONGRESS.

THE programme of the Section of Psychological Medicine and Diseases of the Nervous System, at the recent congress, was a highly promising one. It announced the reading of a variety of interesting papers, and a very large representation of foreign specialists amongst the readers. But the programme was widely diverged from, and, of the forty papers announced, less than half (and not, perhaps, in every respect the best half) were presented. Hardly one-quarter of the foreign delegates who were announced to present memoirs were present to do so. While thus the expectations aroused by the inviting programme were naturally destined to disappointment, the proceedings of the section are by no means to be considered unsuccessful. Like the other sections, it suffered considerably by the absence of the leading specialists of the United States. Had the acknowledged leaders of American neurology been announced to be present and to actively participate in the proceedings, not only would all the distinguished foreigners who announced their coming have had greater inducements to come, but the meeting would have recorded the high-water mark of neurological science. Judging the proceedings by the same standard that is to be applied to the entire congress, much can be said in its favor, and some interesting observations and suggestions can be culled from its deliberations. The address of the president of the section, Dr. J. B. Andrews, gave a very useful summary of the distribution and care of the insane in this country. Throughout the country there is one insane person to 545 individuals; but this ratio does not hold for all the various elements. The leaders of our civilization, and, above all, the foreign element, who have the difficult problem of adapting themselves to a violent change in their life-habits amid the pressure of a sharp competition, are the victims of mental break-down. One in every 250 of the foreign population is insane, one in 618 of the native whites, and only one in 1,097 of the colored population. But even in the last mentioned their emancipation and free admittance to civilization have more than doubled their former percentage of insanity. This fact — that insanity is a disease of civilization — is also shown by the fact that the prevalence declines as we move towards the west and away from the cities. Insanity, moreover, is on the increase, and in this country at the startling rate of nine per cent per annum. Dr. Andrews also described the great improvement in the rational care of the insane (and this, in part, accounts for the increased longevity, and thus the increased number, of this class), and added, that, if this country had little new to show, it at least manifested its ability to keep abreast with the progress of other countries.

Dr. D. Hack Tuke of London sent a paper in which he compared the insane of this country with those of England. The difference in the nature of the asylums of the two countries makes an accurate comparison impossible, but such comparison yields much more similarity than difference. Dr. Tuke favored the 'segregation' plan, in which one patient, or at most a few, are under care in the same homestead, and welcomed the now general agreement that mechanical restraint was to be used only in exceptional cases, but that in such cases it is to be unhesitatingly employed.

Dr. H. M. Hurd of Michigan presented a valuable sketch of the development of religious insanity, tracing the relation between the nature of the morbid delusion and its physical excitant, and again with the age, sex, mental development, etc., of the individual. The healthiness of the religious sentiment lies in a just development of the emotional with the intellectual faculties.

Dr. Langdon Down of London described several interesting cases in which mental deficiency was associated with a prow-shaped cranium. The cause of this, Dr. Down referred to an abnormal juncture of the medio-frontal suture. The break-down in such cases may occur at any important change, — at first or second dentition, at puberty, or even later, — and the deficiency may vary from mere stammering and sluggishness of thought to marked idiocy. The education of children with this cranial mark should be a most special and careful one.

Dr. Horace Wardner of Illinois showed most conclusively the admirable effect of occupation in insanity. In a well-managed asylum eighty per cent of the inmates can be usefully employed, and this employment made an essential factor in their cure: it diverts their mind from brooding over themselves and their imaginary ills, prevents *ennui*, and establishes a healthy rhythm. Dr. Wardner cited several cases in which the occupation learned in the asylum became a means of livelihood after dismissal from the asylum. Such patients, while not cured, were yet able to begin life anew on a lower and simpler plane: they had not regained full mental power, but occupation had rescued them from chronic insanity to a condition of social usefulness.

Dr. G. Fielding Blandford of London presented before the entire congress a paper on the treatment of recent cases of insanity in asylums and in private houses, originally intended for this section. He showed how frequently a violent outbreak of mania passes away quite suddenly, and leaves the patient in full health. In all such cases the stigma, rightly or wrongly, attached to having been in an asylum can and should be avoided. The physician should have the right to keep patients of this general class outside of an asylum long enough to judge whether such a course is necessary or advisable. Dr. Blandford then gave criteria for distinguishing between cases which could be best cured in a private house and those who needed the 'judicious neglect' of a public asylum. Reform in the treatment of the insane will certainly take place in the direction indicated by Dr. Blandford.

Dr. T. W. Fisher of Boston spoke on the modern equivalents of 'monomania.' He found these in the current terms 'paranoia' (which corresponds closely to 'crankiness'), the German 'primäre verrücktheit,' and the like: he argued for the separate recognition of this form of mental alienation, and gave certain marks by which to distinguish it.

Professor Mendel of Berlin, in a paper on moral insanity, advocated a disuse of the term on the ground that it was either a form of congenital imbecility or an accompaniment of paranoia resulting from a systematic delusion, and that it was a dangerous plea to bring before the courts.

Several anatomical papers were presented. Amongst these, one by Professor Mendel, on the origin of the ocular branch of the

facial nerve, was especially important. Dr. Mendel experimented by destroying the muscles supplied by these nerve-branches (mainly the muscle raising the upper eyelid) in young animals, and then observed the atrophy of nerve fibre and cell in the central nervous system. He found that the origin of this nerve-branch was not, as is currently supposed, in the general nucleus of the facial nerve, but in the posterior part of the nucleus of the oculo-motor nerve. This is another evidence to the fact that the nerve-centres are arranged for co-ordination of function (not for topographical convenience), those nerves arising from a common centre as must frequently act together in exciting a useful movement.

Dr. Spitzka of New York showed the cerebellum of a child of five years, who had never learned to speak or walk. The cerebellum was enormously asymmetric, and the entire brain and much of the body presented striking abnormalities.

Dr. Homen of Finland described a distinction between the motor and sensory areas of the spinal nerves as brought about by atrophy resulting from amputations. Dr. Otto of Munich advocated the use of magenta as a staining for sections of the nervous system.

Quite a number of papers of much too general a character were presented. Such papers, however valuable in themselves, are too much the record of individual opinions to be profitably presented at an international meeting. Such questions as the 'definition of insanity,' 'the classification of insanity,' and the like, are sure to be profitless; at least, until we know much more of the pathological nature of mental aberration than we do now. A very opposite criticism is to be passed upon the discussion on the relation of syphilis to insanity, which aroused much interest, and was practically and profitably conducted. The leader in the discussion was Dr. G. H. Savage of Bethlem, England.

MENTAL SCIENCE.

The Chronological Progress of Infants.

THE scientific observation of the early stages of development of the human infant, though no longer a novelty, can be said to have yielded only the first suggestions of the valuable generalizations which this study is destined in part to discover and in part to corroborate. Amongst these generalizations the most important is that psychological law which finds its analogue in the embryological law that the early life-stages of a species high in the animal scale repeat in part the mature stages of an animal lower in the scale, and announces that the mental development of the child repeats in part the development of the race. The many and suggestive analogies between the emotional traits and thought-habits of children and of savages have been frequently recorded, and their importance is more and more widely appreciated. Nor has the practical aspect of infant psychology been neglected. Once educators have recognized that this study promises a surer basis for early school-room work than any amount of simplification of exercises originally arranged for more mature minds, it makes the teacher learn from as well as teach the pupil. One educational body has asked for systematic records of child-growth, bodily and mental, and a few normal schools are substituting for the dry and often narrow course in 'Methods of Teaching,' a practical and original essay recording observations of various traits of child-life. One main purpose in all such records has been to get an average of the date and order of appearance of the several acts, instincts, emotions, ideas, and so on, in the child. In the process of obtaining such an average, much information will at the same time be gained as to the range of variation in time of appearance of the several traits, of the influence of sex, of heredity, of nationality, and of environment upon them. When such a record will be at our command, the rate of progress of any particular child, whether precocious or backward, will be easily ascertainable, and much energy be saved in propping up what needs support, in checking over-development of certain traits, and thus promoting that harmonious all-sided growth which modern education regards as its ideal. The caution in the process should be in the direction of remembering the individual variation as well as the average, — that by nature men are far from being alike, and civilization requires them to be so only in a very restricted though important field of activity.

Dr. Stanford E. Chaillé of the Tulane University has recently put together, in a form very convenient for others to supplement and perfect, the various stages of infant progress. He gives in a series of brief paragraphs the chief acquisitions which the average infant may be expected to exhibit for each month of the first year of life, and at intervals of several months from then to the third year. The acts whose appearance he notices include the physical signs as well as the actions on which mental growth is founded. As the article of Dr. Chaillé is itself a *résumé*, it will hardly be profitable to further epitomize the facts there given. Referring to the original paper for the facts (*New Orleans Medical and Surgical Journal*, June, 1887), it will be sufficient to state that they record the various reflexes (sucking, crying, sneezing, etc.) existing from birth, the order of the development of the senses (taste first) and the gradual change in their relative educational importance, the accommodation to the environment, the interpretation of the objective world (as the inference of distance by sight), the emotional evolution (fear being the first emotion), the expressions of pleasure and pain, the co-ordination of the muscle-movement into acts, the gradual voluntary control of hands and feet, the first sounds and attempts at language, the appreciation of colors, sounds, odors, and so on. The general conviction which this study has left upon Dr. Chaillé's mind is not in harmony with the popular belief that children are to a larger extent than adults virtuous and guileless, but agrees with the evolutionary notion that the virtues which civilization has taught us to admire are of recent growth, and not innate in the infant, whom it is more truthful to regard as a 'darling little savage,' than as a 'dear little angel.'

A point on which this paper is especially complete is the increase of weight, height, and chest-girth with each month of the first year of life, and at longer intervals from then to maturity. During the first three days of life there is a loss of weight, which should be regained by the seventh day. The greatest gain of weight occurs during the first five months, the maximum amount of growth falling probably in the second month, when the increase is from four to seven ounces weekly. From then on, the regular increase of growth which the table records takes place, leaving more room for individual variation with increase of age.

THE EFFECT OF OPIUM ON THE HIGHER ANIMALS. — It has recently been observed that opium affects apes just as it does men, producing all of the physical symptoms, and strongly suggesting the presence of some, at least, of the typical psychical accompaniments. A certain ape would always follow any opium-smoker, would look for the remnants which the smoker left unused, would cry when not admitted to the room where smoking was going on, and so on. The habit takes the same possession of them that it does of men. Apes who are in the habit of getting a little opium are inactive, dull, and useless if they miss their usual dose; and a Chinese merchant is recorded as having a large ape who howls piteously when his usual ration of the drug is denied him. Similar effects have been observed in dogs, and strikingly illustrate the functional similarity of the central nervous system of the higher mammalia.

A CHALLENGE TO THE EVIDENCE FOR THOUGHT PHANTASMS. — An article published in the *Nineteenth Century* for August, by A. Taylor Innes, and entitled 'Where are the Letters?' is in substance an attack on the nature of the evidence for death-bed and other coincidences, which Messrs. Myers, Gurney, and Podmore have collected in their 'Phantasms of the Living.' Most of these stories are those in which a friend or relative of the person concerned is suddenly presented with a vivid impression that the person in question, who is far distant, is threatened with danger; the case is then made out that the time of death of the individual coincided with the moment of the apparition to his friend. In a large number of cases documentary evidence of the simultaneity of the two occurrences — as when two letters, each recording one of the events, cross each other — is naturally obtainable; and the writer of the above article claims that in such cases the authors have been satisfied with the mere statement that such evidence existed without actually seeing the letters, and yet regarding such evidence as of first-class value. An actual examination shows how worthless such statements often are. In nine cases in which they did see the original manuscript the evidence is declared unsatis-

factory. On the basis of such omissions, a general distrust is thrown about the whole work, which only a very careful and accurate refutation by the authors of the work can remove.

BOOK-REVIEWS.

The Origin of Mountain Ranges, considered Experimentally, Structurally, Dynamically, and in Relation to their Geological History. By T. MELLARD READE. London, Taylor & Francis. 8°.

MOUNTAIN ranges, that show the effects of lateral compression in their folded structure, are explained by most geologists by means of Elie de Beaumont's 'contractional hypothesis:' the interior of the earth is thought to be contracting as it cools, and the outer part, or 'crust,' wrinkles as it settles down to accommodate itself to the diminished interior. But in recent years several geologists have urged that this hypothesis was quantitatively insufficient to account for the known mountain ranges, and while these criticisms do not seem to me to be by any means fatal to the effective working of the contractional process to a considerable extent, they have served a good purpose in emphasizing the need of further search for methods of mountain-making. The want of any sufficient means of accounting for plateaus of massive elevation, also points to the importance of further study of the physics of the earth.

The illustrious Playfair, writing early in this century, thought nothing so capable of causing a slow-acting, irresistible elevatory force as the expansive power of heat; but he suggested no means of applying the heat in proper time, place, and quantity. Mr. Mellard Reade, following out an idea advanced by Capt. Thos. Hutton of New Zealand, and others, attempts to supply this deficiency as follows: mountain regions were once regions of heavy sedimentation; the slow accumulation of sediments caused a depression, and a consequent warming of the mass beneath them; the warming mass tends to expand in all directions, but can expand only vertically; and, in this conversion of cubic into linear expansion, Mr. Reade finds a sufficient cause for the extravasation of lavas, the elevation of plateaus, and the crushing deformation of mountain ranges. The last-named process seems to me only remotely connected with this cause, but the other two may find some or much explanation in it. It is necessary, in order that the process shall work efficiently, that the depression caused by sedimentation, shall for a time go on faster than the consequent ascent of the deep isogeotherms; if we admit this to be possible, the hypothesis gives a qualitatively correct explanation of those paradoxical changes of level seen in the elevation of areas heavily loaded with sediments, and the depression of lands deeply denuded; it also suggests a reasonable correlation between the slow, light sedimentation of such regions as Wisconsin, and their long exemption from serious disturbance. The process therefore deserves to be discussed rather than dismissed: working with other processes, it will, I believe, come to be accepted as a useful aid to a common end.

W. M. D.

The Teaching of Geography. By ARCHIBALD GEIKIE. London, Macmillan. 12°.

THE book under review is the first volume of Macmillan's geographical series, which is edited by Archibald Geikie. It is an introduction on the teaching of geography, in which the author sets forth his views on the scope and goal of geographical science and of the methods of teaching it. The book shows in an admirable way how geography can be made a useful and attractive study, how in teaching it the mental faculties of the child can be developed and its power of observation increased.

Of course, the author's method rests on the views he holds on the aims and method of geography. He says (p. 2), "It is the special function of geography to direct our attention to the [phenomena surrounding us], to increase our knowledge of the country we live in, and thence to trace analogies and contrasts among the aspects of nature in other regions of the globe. Geography compares the topography of one continent with that of another, dwelling upon the fundamental elements of each, and showing how they have affected the distribution and development of the human population. . . . In gathering the materials for this comprehensive picture of the earth as the dwelling-place of man, geography culls freely from almost every branch of natural science and from history."

From this standpoint the subject is admirably treated. Geikie shows how every single fact and every single observation can be made use of from a geographical standpoint, — the state of the weather, the furniture of the school-room, the silk kerchief of a child, or the coal used for fuel. He makes the study of the surroundings the starting-point for teaching phenomena of natural history, of meteorology, history, and of social science. But it seems to us that if the curriculum of a school should be planned out according to Geikie's suggestions, the geographical point of view would become too predominant. His recommendation that actual observations should always be the foundation of teaching is of eminent importance, but observations must not be exclusively treated from a geographical standpoint.

Two ends are to be kept in view in teaching: the development of the power of reasoning and of observation, and that of the heart and feelings. In the elementary stage both goals are attained by inducing the child to look at the things themselves, and to take a lively interest in them, and by training it to notice differences in things. By this method the child gains an active interest in the subject which it is taught, and a foundation is laid for future explanations and classifications. So far, Geikie's proposals cannot be excelled. But later on, the character of the natural sciences and physics makes it necessary that they deal to a great extent with generalizations and abstractions which only educate the powers of reasoning. Geography acts as an important counterbalance against this tendency, and we should wish that this fact had been more energetically emphasized by the author. He recognizes this fact, and mentions it in several passages of the book, e.g., "The objects of excursions are to train the pupils in habits of observation and reflection, to teach them the elements of topography, to enlarge their capacity for the comprehension of geography, and generally to stimulate their love of nature" (p. 73). But it is our opinion that this last point ought to be made the principal goal of geography-teaching in all grades. While the teacher of natural science chiefly develops the power of reasoning, the geographer must always try to keep alive the actual interest in the individual phenomenon as it presents itself to the eye, and in the mutual interdependence of its parts. Therefore geography must be placed in the curriculum of the school in one class with history and literature, and in advanced teaching it ought to be treated accordingly.

If Geikie's proposals for elementary teaching were accepted by teachers, — not of geography alone, — and if the historical standpoint were to be taught in the same enlightened way, a great step forward would be made.

We agree more fully with the author's views on the teaching of physical geography than with his treatment of political geography. Many subjects upon which he touches, which belong to linguistics and social science, seem to be too difficult to be grasped by a child, and others can be more adequately dealt with from an historical point of view than from a geographical one. The cultivation of land, its products, the situation of villages and roads, and similar subjects, may be treated with advantage, while money, telegraph, and post, etc., are more satisfactorily dealt with from an historical standpoint. Particular care ought to be taken in treating anthropogeographical subjects, for most of these phenomena are so complicated that the juvenile mind is unable to grasp them. Science itself has not treated these subjects in a satisfactory way, and most of its theories are vague and not well founded. We should hesitate, for instance, to lay any stress on such facts as the position of Britain in the very midst of the land hemisphere (p. 198), as upon thorough investigation it may be shown that in fact they are only of secondary importance. But the elementary problems of anthropogeography may be treated: the influence of climate upon the life of peoples and man, the means of communication, and their dependence upon the configuration of the ground, etc.

The present book, and several other publications, are proof of the stimulus the teaching of geography has received in England by the endeavors of the Royal Geographical Society. So far, little interest has been awakened on this side of the ocean, but publications of this kind cannot fail to excite the interest of American geographers.

F. BOAS.

Elements of Botany, including Organography, Vegetable Histology, Vegetable Physiology, and Vegetable Taxonomy, and a Glossary of Botanical Terms. By EDSON S. BASTIN. Chicago, G. P. Engelhard & Co. 8°.

IF one can judge by the number of text-books on botany which have been published in this country during the last few years, either the number of botanical students must be very large, or the different text-books must treat the subject inadequately, for each new work has for its ostensible purpose the 'filling of a long-felt want.' What the want is, is not easy to say, unless it be a book which shall contain every thing in small compass, and that is a practical impossibility. The 'Elements of Botany,' by Professor Bastin, certainly gives a great deal in small compass, and must be considered one of the best treatises on the subject yet published in this country. It is evidently the work of a teacher, rather than a specialist, and gives the substance of what must usually be sought in several different text-books, and, while it cannot replace other well-known treatises, it forms a good introduction to them. The illustrations are numerous and generally good, and the style is clear and as attractive as could be expected considering the condensed form. Two-thirds of the book are devoted to organography and histology, — subjects which are best adapted to beginners. The chapters on physiology are very brief, but the subject is well treated. The same can hardly be said of the chapters on vegetable taxonomy, by which the author understands a description of the different classes of the vegetable kingdom. The illustrations of this part are not so good as those of the earlier parts, and the descriptions are not infrequently obscure, and also at times incorrect. The yeast-plant, for instance, cannot be said to belong to the *Schizomycetes*. It is to be regretted that authors of botanical text-books to be used by beginners almost invariably crowd a general account of the different classes into a few pages at the end. Treated in this way, the subject is always unintelligible, or next to unintelligible, and the space had better be used in amplifying other subjects and the student referred to larger and special works for an account of the classes.

An Introduction to Greek Sculpture. By L. E. UPCOTT. Oxford, Clarendon Pr. 12°.

NO book of similar aim and scope can compare for a moment with this little book. It was originally written as a guide to the author's collection of casts and photographs from the antique at Marlborough College. It is now enlarged somewhat, and has in view a museum of casts and photographs adapted to the needs of a school or college. Mr. Upcott mentions the religious origin of Greek sculpture, notes its peculiar characteristics, and traces its development from the half-mythical Dædalus to the Græco-Roman period. The book is at once clear, compact, and comprehensive, and the best manual of Greek sculpture in the language.

The Graphical Statics of Mechanism. By GUSTAV HERRMANN. New York, Van Nostrand. 16°.

THIS is a translation into English of Professor Herrmann's work, which has already been published in German and French. The great advantage which the method presents is its simplicity. By the use over and over again of a few easily mastered principles, the most complicated problem may be solved. No knowledge of higher mathematics is required in its mastery, and no handling of lengthy and involved algebraic formulas is necessary in its use. The object of the treatise is principally to facilitate study for the students of technical schools, upon whose time and industry increasing demands are made from day to day.

NOTES AND NEWS.

THE earthquake of Central Asia, the principal shock of which occurred on June 19, has a remarkable feature in common with the Charleston earthquake. In most cases chains of mountains prevent the spreading of the shocks, but in these cases high ranges were crossed. The Charleston earthquake traversed the Alleghanies, and that of Vernoye — the situation of which may be seen on our map of Central Asia (Aug. 5) — was felt on the Issik-Kul, though the chains of the Ala-tau lie between the centre of the disturbance and that lake. The epicentre was in the district of Aksai, about fifteen miles west of Vernoye. About 800 persons are said to have been killed by falling houses and rocks rolling down from the mountains. Numerous fissures were formed on the northern slope of the Ala-tau, particularly near Vernoye. East of this place the shocks were less destructive. Part of the shore of Issik-Kul moved three feet downward. An expedition is at present at work to investigate the geological structure of the disturbed area.

— We learn that the Signal Service has ordered the abandonment of the following stations on the Pacific coast: Monterey, San Luis Obispo, Bakersfield, Modesto, Indio, San Bernardino, Carson, Yreka, Santa Rosa, and Mendocino City. As soon as the official intention was announced, the publisher of the San Francisco *Chronicle* came forward and offered to provide observers, pay for telegrams, warnings, and so forth, provided that the government would allow the instruments to remain. This offer has been accepted.

— It will be of interest to learn, says *The Publishers' Weekly*, that the adherents of the international language Volapük have just held a congress at Munich, presided over by Professor Kirchhoff of the University of Halle. It was decided to use the home spelling for proper names, to drop the ceremonial form 'you' (employing 'thou' in the singular), and to make some few simplifications in spelling and grammar. The most important action was the establishment of a Volapük academy, to whom all future grammatical and lexicographical difficulties shall be submitted. Eighteen academicians were elected, representing Germany, Hungary, Austria, Holland, Russia, Sweden, France, Spain, Portugal, Italy, Asia Minor, England, and North America. The American representative is Mr. Charles E. Sprague of New York.

LETTERS TO THE EDITOR.

*** The attention of scientific men is called to the advantages of the correspondence columns of* SCIENCE *for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Is there a Diamond-Field in Kentucky?

THE great similarity of the peridotite of Elliott County, Ky., to that of the South African diamond-fields has attracted considerable attention, and hundreds of prospectors, moved by 'interesting possibilities,' have visited the region in search of gems and precious metals.

In May, 1885, when the peridotite of Kentucky was studied in the field, the character of the diamond-bearing rock in South Africa was not yet fully understood, and consequently no search was made at the time for diamonds. Recent developments, however, rendered it desirable that they should be intelligently sought for; and upon the invitation of Mr. J. R. Procter, the State geologist of Kentucky, we were sent by Maj. J. W. Powell, the director of the United States Geological Survey, to make the investigation.

The locality is easily reached by way of the East Kentucky Railroad, which ends in Carter County at Willard, where conveyance may be obtained of the farmers to traverse the remaining ten miles to the best exposures of the peridotite along Isom's Creek, in Elliott County.

The peridotite alters and disintegrates readily; but, from the fact that the declivity of the surface is considerable, the transportation of material almost keeps pace with disintegration, and there is no great accumulation of residuary deposits upon the narrow divides and hillsides. The specific gravity and durability of the gems found in connection with peridotite are generally greater than those of serpentine and other products of its alteration. On this account the gems accumulate upon the surface and in favorable positions along adjacent lines of drainage. Our plan was to search by sifting and carefully panning the stream-beds receiving the drainage directly from the surface of the peridotite, and to enlist the services of the people in the neighborhood to scrutinize the steep slopes where gems weathered out of the peridotite might be exposed. Particular attention was directed also to the examination of the

solid rock and residuary deposits which so closely resemble the diamantiferous material of the South African mines.

The accompanying map, introduced, with corrections and additions, from the United States Geological Survey, Bulletin No. 38, shows the distribution of the exposed peridotite and the soil resulting from its disintegration. It is only a sketch-map, and does not pretend to a high degree of accuracy, but will be found of great service in the field.

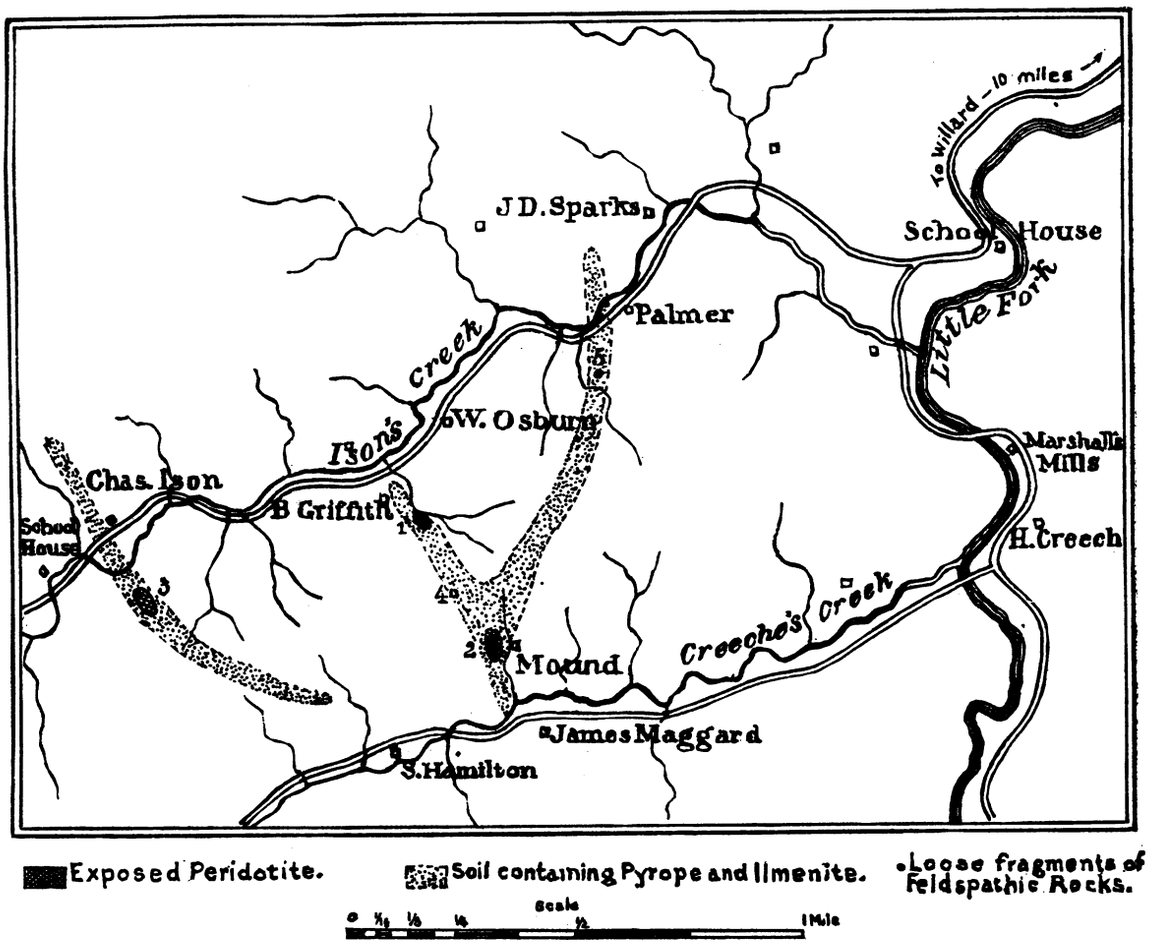
The embankment, which was formerly regarded as the site of an old furnace, has proved to be an Indian mound in which arrow-heads and fragments of celts have been found. Several years ago the mound was opened to a considerable depth by Mr. James Maggard, who reports ashes near its centre. The excavation made for us during our brief sojourn did not reach the ashes. The mound is composed chiefly of the sand resulting from the disintegration of the adjacent peridotite, and a number of pieces of peridotite, preserving all their form, but entirely altered with the exception of the garnet and ilmenite, which only appear broken up. The olivine had changed, however, to a deweylite-like mineral, so soft and of such a structure that it has received the local name of 'mutton tallow,' and, when first taken out, can be worked as readily as that substance.

It is about one hundred feet in diameter and thirty feet in height, and some large trees had originally grown on the top. Until our recent visit the actual contact of the peridotite and shale had not been observed. It is exposed in the bed of a small branch of Isom's Creek, within a hundred yards of Charles Isom's house. The intrusion of the peridotite has displaced and greatly fractured the shale, besides locally indurating it, and enveloping a multitude of its fragments. The latter are dark-colored, like the peridotite, and are strongly contrasted with the light-colored dolomitic nodules of secondary origin.

Besides the pyropes, a few of which are good enough for cutting, several fairly good specimens of a green pyroxene have been found, and are here reported for the first time. When suitably prepared, they will make worthy additions to the gem collection of the National Museum. They resemble the same transparent mineral from Arizona. The South African specimens of the mineral are a little more opaque, but of a richer green color.

During a careful search over a small area for nearly two days, no diamonds were found; but this by no means demonstrates that diamonds may not yet be discovered there.

The remarkable similarity between the peridotite of Kentucky and that of the Kimberley and other diamond-mines of South Africa is very striking, and, when this alone is considered, the probability of finding diamonds in Kentucky seems correspondingly great; but when we reflect that the carbonaceous shale, and not the peridotite itself, is the source of the carbon out of which the diamond is formed, and that the shale in Kentucky is much poorer in carbon than that of the South African mines, the probability of finding diamonds there is proportionally diminished. H. Carvill Lewis (*Science*, viii. p. 346) remarks concerning the South African mines, that "recent excavations have shown that large quantities of this shale surround the mines, and that they are so highly carbonaceous as to be combustible, smouldering for long periods when accidentally fired." In the chemical laboratory of the United States Geological Survey, Mr. J. Edward Whitfield determined 37.521 per cent of carbon in the shale from near the Kimberley mine, while the blackest shale adjoining the peridotite near Charles Isom's in Kentucky, he found to contain only 0.681 per cent of carbon. After all the carbonates were removed by dilute hydrochloric acid, the residue was combusted in oxygen, and the carbon weighed as carbonic dioxide. The peridotite, at the time of its intrusion, must have been forced up through a number of coal-beds, and at a greater depth it penetrated the Devonian black shale, which is considerably richer in carbon than the shale now exposed at the surface. It is possible, and not improbable, that if the theory of the igneous origin of diamonds first proposed by Roscoe Cohen (Proceedings of



the Manchester Literary and Philosophical Society, Oct. 7, 1884, p. 5), and later independently advanced by H. Carvill Lewis, be true, a number of diamonds may have been formed in the Kentucky peridotite; but the general paucity of carbon in the rock adjacent to the peridotite is certainly discouraging to the prospector.

The best time to search for gems in that locality is immediately after a heavy rain, when they are most likely to be well exposed upon the surface. It is proposed to keep up the search economically by those most interested, by furnishing to responsible individuals in the vicinity a number of rough diamonds mounted in rings, for comparison, that they may know what to look for under the most favorable circumstances.

J. S. DILLER.
GEO. F. KUNZ.

New York, Sept. 12.

The Classification of Lakes.

SEVERAL years ago I presented to the Boston Society of Natural History a paper on the classification of lake-basins, in which the many varieties of lakes were grouped under three heads, according as they were made by constructive, destructive, or obstructive processes. The first heading included lakes made by mountain-folding and other displacements; the second consisted chiefly of basins of glacial erosion; the third contained the greatest number of varieties, such as lakes held by lava, ice, and drift barriers, delta and ox-bow lakes, and some others. The classification proved satisfactory, in so far as it suggested a systematic arrangement of all kinds of lakes that have been described; but it now appears unsatisfactory, inasmuch as its arrangement is artificial, without reference to the natural relations of lakes to the development of the drainage systems of which they are a part. A more natural classification is here presented in outline.

When a new land rises from below the sea, or when an old land is seized by active mountain-growth, new rivers establish themselves upon the surface in accordance with the slopes presented, and at once set to work at their long task of carrying away all of the mass that stands above sea-level. At first, before the water-ways are well cut, the drainage is commonly imperfect: lakes stand in the undrained depressions. Such lakes are the manifest signs of immaturity in the life of their drainage system. We see examples of them on new land in southern Florida; and on a region lately and actively disturbed in southern Idaho, among the blocks of faulted country described by Russell. But as time passes, the streams fill up the basins and cut down the barriers, and the lakes disappear. A mature river of uninterrupted development has no such immature features remaining. The life of most rivers is, however, so long, that few, if any, complete their original tasks undisturbed. Later mountain-growth may repeatedly obstruct their flow; lakes appear again, and the river is rejuvenated. Lake Lucerne is thus, as Heim has shown, a sign of local rejuvenation in the generally mature Reuss. The head waters of the Missouri have lately advanced from such rejuvenation; visitors to the National Park may see that the Yellowstone has just regained its former steady flow by cutting down a gate through the mountains above Livingston, and so draining the lake that not long ago stood for a time in Paradise Valley. The absence of lakes in the Alleghany Mountains, that was a matter of surprise to Lyell, does not indicate any peculiarity in the growth of the mountains, but only that they and their drainage system are very old.

The disappearance of original and mountain-made lakes is therefore a sign of advancing development in a river. Conversely, the formation of small shallow lakes of quite another character marks adolescence and middle life. During adolescence, when the head-water streams are increasing in number and size, and making rapid conquest of land-waste, the lower trunk-stream may be overloaded with silt, and build up its flood-plain so fast that its smaller tributaries cannot keep pace with it: so the lakes are formed on either side of the Red River of Louisiana, arranged like leaves on a stem; the lower Danube seems to present a similar case. The flood-plains of well-matured streams have so gentle a slope that their channels meander through great curves. When a meander is abandoned for a cut-off, it remains for a time as a crescentic lake. When rivers get on so far as to form large deltas, lakes often collect in the areas of less sedimentation between the divaricating channels. Deltas that are built on land, where the descent of a stream is suddenly lessened and its enclosing valley-slopes disappear, do not often hold lakes on their own surface; for their slope is, although gentle, rather too steep for that: but they commonly enough form a lake by obstructing the stream in whose valley they are built. Tulare Lake in southern California has been explained by Whitney in this way.

The contest for drainage area that goes on between streams heading on the opposite slopes of a divide sometimes produces little lakes. The victorious stream forces the divide to migrate slowly away from its steeper slope, and the stream that is thus robbed of its head waters may have its diminished volume clogged by the fan-deltas of side-branches farther down its valley. Heim has explained the lakes of the Engadine in this way. The Maira has, like an Italian brigand, plundered the Inn of two or more of its upper streams, and the Inn is consequently ponded back at San Moritz and Silvaplana. On the other hand, the victorious stream may by this sort of conquest so greatly enlarge its volume, and thereby so quickly cut down its upper valley, that its lower course will be flooded with gravel and sand, and its weaker side-streams ponded back. No cases of this kind are described, to my knowledge, but they will very likely be found; or we may at least expect them to appear when the northern branches of the Indus cut their way backwards through the innermost range of the Himalaya, and gain possession of the drainage of the plateaus beyond; for then, as the high-level waters find a steep outlet to a low-level discharge, they will carve out cañons the like of which even Dutton has not seen, and the heavy wash of waste will shut in lakes in lateral ravines at many points along the lower valleys.

In its old age, a river settles down to a quiet, easy, steady-going existence. It has overcome the difficulties of its youth, it has corrected the defects that arose from a period of too rapid growth, it has adjusted the contentions along the boundary-lines of its several members, and has established peaceful relations with its neighbors: its lakes disappear, and it flows along channels that meet no ascending slope on their way to the sea.

Certain accidents to which rivers are subject are responsible for many lakes. Accidents of the hot kind, as they may be called for elementary distinction, are seen in lava-flows, which build great dams across valleys: the marshes around the edge of the Snake River lava-sheets seem to be lakes of this sort, verging on extinction: crater lakes are associated with other forms of eruption. Accidents of the cold kind are the glacial invasions: we are perhaps disposed to overrate the general importance of these in the long history of the world, because the last one was so recent, and has left its numerous traces so near the centres of our civilization; but the temporary importance of the last glacial accident in explaining our home geography and our human history can hardly be exaggerated. During the presence of the ice, especially during its retreat, short-lived lakes were common about its margin. Claypole has just described the extinct 'Lake Cuyahoga' in Ohio as of this kind. We owe many prairies to such lakes. The rivers running from the ice-front, overloaded with sand and silt, filled up their valleys and ponded back their non-glacial side-streams; their shore-lines have been briefly described in Ohio and Wisconsin, but the lakes themselves were drained when their flood-plain barriers were terraced; they form an extinct species, closely allied to the existing Danube and Red River type. As the ice-sheet melts away, it discloses a surface on which the drift has been so irregularly accumulated that the new drainage is everywhere embarrassed, and lakes are for a time very numerous. Moreover, the erosion accomplished by the ice, especially near the centres of glaciation, must be held responsible for many, though by no means for most, of these lakes. Canada is the American type, and Finland the European, of land-surface in this condition. The drainage is seen to be very immature, but the immaturity is not at all of the kind that characterized the first settlement of rivers on these old lands: it is a case, not of rejuvenation, but of regeneration; the icy baptism of the lands has converted their streams to a new spirit of lacustrine hesitation unknown before. We cannot, however, expect the conversion to last very long: there is already apparent a backsliding to the earlier faith of steady flow, to which undisturbed rivers adhere closely throughout their life.

Water-surface is, for the needs of man, so unlike land-surface, that it is natural enough to include all water-basins under the single geographic term, 'lakes.' Wherever they occur, — in narrow mountain-valleys or on broad, level plains; on divides or on deltas; in solid rock or in alluvium, — they are all given one name. But if we in imagination lengthen our life so that we witness the growth of a river-system as we now watch the growth of plants, we must then as readily perceive and as little confuse the several physiographic kinds of lakes as we now distinguish the cotyledons, the leaves, the galls, and the flowers, of a quickly growing annual that produces all these forms in appropriate order and position in the brief course of a single summer. W. M. DAVIS.

Cambridge, Mass., Sept 7.

Corruption of American Geographic Names.

MR. MURDOCK'S friendly criticism and confirmatory note on the pronunciation of 'Arkansas,' in the last *Science*, is gratifying from the fact that it will help disseminate a proper understanding of that word. But 'Arkansas' is only one of hundreds of geographic names which have been corrupted under our very noses, so to speak, and I believe it behooves all educators to assist in their correction. In the West we have many classes of descriptive geographic names, — first, words in the Indian language, which the Spanish, French, or English (and sometimes all) have endeavored to represent phonetically in their own language, such as 'Ouachita,' 'Washita,' 'Wichita,' etc., all derived from the name of a tribe of Indians first noted by La Salle, and which has now been applied in its modifications to six rivers (not including creeks) in Indian Territory, Arkansas, and Texas, two mountain areas, and innumerable political divisions, such as counties, post-offices, etc.; second, descriptive names. To the credit of the Spaniards, it must be said that they seldom adopted Indian names, but gave either descriptive names, such as 'Sabinas,' 'Ulmas,' 'Puercos,' 'Colorado,' often of the forest-growth and character of sediment of rivers; or religious names, such as 'Corpus Christi,' 'Vera Cruz;' or sometimes a combination of both, such as 'Sangre de Cristo' Mountains.

Most of our American names in the West, and especially the South-west, are simply abominable. They are either corruptions of the French, Indian, or Spanish, or indefinite appellatives, often of lewd and repulsive meaning. This is especially true of the names given by my fellow-southerners, as they followed the law of migrations along degrees of latitude. In central and western Texas there is another corruption which is more misleading than that of mispronunciation or misspelling. The generic topographic terms are all erroneously used for the subgeneric, such as 'river' for 'creek' (or what can only be properly expressed by the Spanish *arroyo*), and 'mountain,' 'peak,' etc., for 'knolls,' 'buttes,' or 'mesas.' For instance: while there is not a true mountain in Texas east of the Pecos River, there are no less than a dozen 'Round Mountains,' 'Pilot Peaks,' 'Comanche Peaks,' 'Hog and Packsaddle Mountains,' etc., in central Texas, none of which in any way are entitled to the dignity of the terms, and which can only be described as buttes and mesas of secondary proportions. The creeks and rivers are either 'Hog' creeks, 'Muddy,' 'Snake,' 'Buffalo,' 'Dry,' 'Indian,' or 'Post Oaks.'

Not only have these corruptions been going on in the past, but they are being perpetrated at present, and our government publications are innocently the chief instruments in so doing. A remarkable instance came under my observation two years ago. While sitting upon the stone that marks the north-west corner of the State of Kansas, examining some geological specimens, and conversing with Texan cowboy friends who had 'wintered' near there a year or two, I inquired the nearest post-office. One of them informed me that a [tent] village had just been established a few miles distant, and that its name was 'Bueno.' This word, from my past experience on the Texan frontier, I knew to constitute nine tenths of the cow-boy's knowledge of pigeon Spanish (the other tenth being 'cuss' words), and that it had been imported from the Rio Grande by him into Kansas, and that the 'short-horns' (the cowboys' term of inferiority for the Kansas settler) had been fascinated by it, and applied it to their new town. A capital idea, I thought, until I looked up the name of the town in the latest post-office guide, when, to my horror, I found my pet Spanish word 'bueno' anglicized into 'Wano.' The other instance of governmental perpetration is on the topographic maps of both the Post-Office and War Departments, and Geological and Coast Surveys, where these dry creeks continue to appear as rivers, and buttes as mountains, etc.

Since my arrival in Arkansas, I have been delighted to find numerous minor French geographic names which have not been corrupted, such as 'L'Eau Frais,' 'Terre Noir,' 'Antoine,' and other streams; and from the oldest Anglo-American inhabitants I learn that nearly every geographic feature of southern Arkansas was named, not by French missionaries, but by the trappers and *voyageurs*, who had traded with the Indians for a hundred years or more, and who dominated here almost until the State was admitted to the Union (1836). Many descendants of these old French pioneers inhabit south-eastern Arkansas, and it is a source of gratification that the Anglo-American settlers here, however illiterate, pronounce the names with approximate correctness, even if their attempts at spelling them are oftentimes ridiculous. ROB'T T. HILL.

Ouachita River, Ark., Sept. 8.

Romantic Love and Personal Beauty.

THE latest contribution to the theory of evolution is the attempt of Mr. Finck to show that the phase of human character known as romantic (pre-nuptial) love is strictly modern, having developed within the last 1,000 years. The book in which the argument is set forth, recently reviewed in this magazine, is a remarkable combination, which one hardly knows whether to accept as a joke or in earnest. In this one work we find a scientific discussion of love as found in plants and animals, theories as to its origin and import; we find many surprising statements concerning modern society, such as that there can never be too much of flirtation, since it is one of the most valuable discoveries of the English people; that beauty in children is dependent upon the pre-nuptial love of their parents; we find directions to the maiden how to win her lover, directions to the love-sick swain as to his cure, directions to the lover how to kiss, etc.; the whole making such a curious combination that we hardly know whether to set the book aside with a laugh, or to regard it as an important contribution to knowledge. The latter feeling, however, predominates. The fundamental proposition of the discussion, viz., the strictly modern nature of romantic love, is one of great importance, giving as it does entirely new thoughts upon certain phases of modern life. It certainly merits the discussion given it, as well as the further discussion which is sure to follow the study of Mr. Finck's argument.

One cannot read this discussion of romantic love without acknowledging that Mr. Finck has made out a very strong case. The facts which are brought out plainly show that there has been a gradual but great change in the pre-nuptial relations of the sexes, and as a result a great change in the sentiments which precede marriage. A romantic love, which was curbed and repressed by the customs of ancient nations, has, under the influence of modern society, expanded into a greatly exaggerated form, until now it is the theme of about all novels, plays, and poems, occupies largely the thoughts of all young people, and is perhaps the most powerful lever for influencing the lives of mankind. But while we may go thus far with the theory, and recognize that ancient life and literature had very little of love, though modern life and literature are full of it, and that it is only modern society that recognizes the desirability of love-matches, the interpretations which may be drawn from the facts are varied. Mr. Finck interprets these facts as representing the development of a new factor in man's nature, and one which was not and could not have been present in earlier periods of history. It is at least questionable whether this interpretation be the true one.

The author is doubtless right in pointing out the impossibility of any feeling akin to the higher phases of love in the lower races of men. Romantic love is a feeling of high sensitiveness, and only those with highly developed sensibilities can experience it in its fullest degree. Indeed, the bulk of civilized people to-day are not capable of having very lofty experiences in this line. The love which Mr. Finck is writing about is largely ideal rather than actual. It belongs to emotional poets rather than to the common people.

Dante, Goethe, and Heine are exceptional, and their works do not represent the true feelings of mankind. It is the lot of very few to love as did Romeo, and most of us poor mortals cannot understand the feelings of Dante for Beatrice. Highly wrought loves are mostly found in fiction and poetry, seldom in actual life. And yet the average person of to-day is doubtless better able to appreciate such feelings than the average Greek or Roman, both because he is more capable of loving, and because women have been permitted to become more lovable. Society to-day has, then, a much higher development of this feeling than in past times. There has been an increase in the quantity of romantic love, and doubtless in the depth of it. But that romantic love of modern times is a new feeling, is not so evident.

There are many considerations which immediately suggest themselves as enabling us to understand these facts, and they may lead us to believe that romantic love can be traced back much further than 1,000 years, and that it was even in ancient times essentially the same in its nature as now. First, we must notice the change which has come over the spirit of literature in modern times: it is by no means fair to compare modern literature with the ancient upon this subject. At the time when the classics were written, books were great rarities, laboriously copied by hand, possessed only by the rich, and read only by scholars. In modern times printing has thrown all literature open to every one in civilized communities. The classical authors thus wrote to the few; the modern authors to the many. The former wrote from love of the art simply, and were supported by the patronage of rich men: the latter write for a living from the sale of their works. While the former were, therefore, free to follow wherever art led them, the majority of authors to-day must write that which will best please their readers. In former times it was only the genius who could hope to acquire any thing by writing: to-day many a writer of mediocre ability makes his living by the use of his pen. It is clear enough why such writers, wishing to obtain as many readers as possible, should choose the most common and yet most delightful experience of life as a theme. It is to these facts largely that we owe the great development of the love-literature of modern times, and partly at least the dearth of it in ancient times. If modern writers thought that only scholars would read their works, and common people know nothing about them, is it not certain that most of our love-literature would disappear? Now, it is, we believe, the development of the modern love-story and poetry, and not the isolated masterpieces of Dante and Shakspeare, which gives us the impression of the great prevalence of romantic love to-day. Blot out all our modern light fiction and other works inspired by money-getting, and Romeo and Juliet would seem as strained and out of place to-day as Mr. Finck thinks the works of Ovid were in the day in which they were written. Indeed, there are few of us now who do not regard this play of Shakspeare as much overdrawn.

We cannot, then, expect love-stories in the literature of early times, and what few references we may find to love here have for this reason the more significance. Now, the very citations used by Mr. Finck in support of his proposition seem to us to go far toward showing that romantic love was by no means an unknown experience in the ancient nations. Ovid was certainly a love-poet, and, even though he was ahead of his age, it is hardly credible that he would give directions to lovers if lovers were unknown. Modern literature gives few more romantic love-stories than that of Cleopatra. Virgil's account of the love of Æneus and Dido could not have been written by one who lived before the time of the birth of romantic love. Even Mr. Finck admits that the Hetære inspired the Greeks with feelings akin to love. Was it not, indeed, exactly the same feeling as modern love applied to a different end? Modern love does not go beyond the extent to which the love of Paris and Helen went to involve a whole nation in war. More significant still, both Greeks and Romans recognized a goddess of love, Venus; and, though perhaps they did not rigidly distinguish between romantic and conjugal love, nothing is plainer than that Venus was not the goddess of conjugal love. The whole account we have of her shows that romantic love was much more closely the idea associated with her than conjugal love. Again, Solomon's Songs, after all that is said about them, could not have been written by one of a nation who knew nothing about love. Did not Jacob serve seven extra years for Rachel because he loved her more than Leah? This is a case which shows that in these early times romantic love existed, and manifested itself in spite of established custom, which compelled the wedding of the elder daughter first.

Or look at the matter in a different way: romantic love at all ages refuses to be trammelled by custom. The French, as Mr. Finck tells us, being unable to find love in courtship, owing to the influences which surround French girls, find it in the greater freedom of women after marriage. This gives us the numerous illicit loves of the French novel. Love leaps beyond the bounds of custom and law. Now, have we not abundant evidence that the same has been true at all times? As our author shows, the customs of ancient nations have been such as almost to preclude romantic love before marriage; but that the feeling has shown itself in other ways seems evident from the universal existence of laws against adultery, the numerous instances of conjugal unfaithfulness, and the care with which husbands have always considered it necessary to guard their wives from contact with other men. And it is suggestive that this care is the greatest where pre-nuptial love is the most strictly prohibited. Such extra-marital loves, which are implied by these facts, though sometimes nothing more than sexual passion, are in many cases the same feeling which Mr. Finck calls romantic love, only applied in a different direction. If the various 'overtones' of romantic love, which Mr. Finck has drawn up, be considered, it will be found that they all apply to this species of love, except perhaps the 'pride of conquest,' which is impossible owing to the necessary secrecy of the matter.

I suspect, therefore, that Mr. Finck has been tracing not so much the birth of a new sentiment as the growth of the institution of courtship; not so much the development of love as the gradual improvement of the condition of woman. In all cases he has drawn a parallel between the stage of development of romantic love and the freedom of woman. His argument has shown the impossibility of courtship in ancient times, rather than the impossibility of love. Where wives were stolen, or bought and sold, or where marriages are merely a matter of business, *mariages de convenance*, it is plain enough that romantic love could seldom exist in connection with marriage. But even under these circumstances the feeling existed, as is shown by the conception of the goddess of romantic love among the Greeks and Romans, the few love snatches of ancient literature, and as is shown by the numerous extra-marital loves of all times. But when in modern times and among civilized nations women have been gradually acquiring freedom and independence, and a right to appear in public before marriage, this feeling of love between the sexes, which had hitherto been usually an unlawful feeling, gradually became directed toward its legitimate end, as a precursor to wedlock. Courtship is therefore a modern institution, which has resulted from the improvement in the condition of woman. But it is more than doubtful whether the love which accompanies it is any thing more than the same feeling between the sexes which has always existed, but applied to a different condition of society.

It may seem that the above is a distinction without a difference, and indeed these suggestions are not given in criticism of Mr. Finck's work, which is certainly to be regarded as one of the valuable contributions to the history of mankind; but there is certainly room to doubt whether Mr. Finck has put the right interpretation on his facts. That Dante was the first love-poet, and that Romeo was the first love-hero of literature, may be true in a sense; and that romantic love has come to fill a place in courtship which it did not formerly hold, may be also true; but we can hardly accept the conclusion that romantic love is of strictly modern birth. The fact of the undoubted existence of extra-marital, though perhaps not pre-nuptial loves at all times, the fact that the literature and mythology of the ancients did contain references to romantic loves, the fact that such loves could not have been then regarded as ennobling owing to the marriage customs, — these, taken with the fact that literature had a different purpose then and now, seem to the present writer rather to indicate that romantic love is nothing new, but that its application to courtship as a preliminary to wedlock is a new phase of life, found only in the customs of a few of the most advanced of modern civilized races.

H. W. CONN.

Middletown, Conn., Sept. 6.